

Appendix C

Summary of Studies Related to Oroville Facilities

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INTRODUCTION

A number of environmental studies are related to the Oroville Facilities. These studies complement the studies developed in the collaborative and contribute toward meeting basic FERC relicensing requirements for the PDEA. Results of these studies will also be used by the Work Groups to help identify areas where further investigation may be needed. These studies are summarized below.

WATER QUALITY

Temperature Model. DWR has been monitoring temperature changes in the Feather River, Thermalito Afterbay, and Thermalito Forebay. A river temperature model, developed by the University of California at Davis (UC Davis) will inform Oroville Project operators on how specific water releases affect temperatures throughout the lower river and will help predict the likely impact of the temperature on river fisheries, recreation, agricultural diverters and the hatchery operations.

AQUATIC RESOURCES

Steelhead Snorkel Surveys. In 1999, DWR focused on determining where juvenile steelhead rear their young and their relative abundance above and below the Thermalito Afterbay outlet. Additionally, DWR identified the types of habitat that juvenile steelhead prefer and their relative availability within the river. Side (secondary) channels within the Low Flow Channel were identified as high density rearing areas.

Snorkel surveys are also being conducted to monitor adult steelhead in the river. The goals are to identify migration timing, determine the number of naturally spawning fish in the population, and locate preferred spawning grounds. Preliminary information suggests that there may be two separate runs of steelhead in the Feather River, one in the winter and one in the spring/summer.

Steelhead Habitat Survey. As part of the steelhead and salmon studies, the Geographic Information Center at California State University at Chico mapped the riparian vegetation of the Feather River. The mapping provides a general overview of the status of the riparian forest but does not provide the small-scale data needed to determine what type of cover is available for steelhead. Therefore, the river's microhabitats are being remapped to count the number and describe the quality of riparian habitat available to rear juvenile steelhead.

Beach Seine Surveys. Beach seine surveys will continue to be conducted monthly to determine the temporal and spatial rearing extent of juvenile steelhead and salmon. Survey sites range from Hatchery Ditch to Boyd Pump boat ramp. Beach seine surveys indicate that a small number of salmon (5,000-15,000) remain in the river throughout the summer and probably migrate in the fall. Beach seining also reveals that few steelhead rear their young for any length of time below the Thermalito Afterbay outlet.

Rotary Screw Trap Sampling, Fyke Sampling, Hatchery and In-Channel Coded Wired Tagging. Rotary screw fish traps will continue to be placed at two locations in the Feather River to monitor the timing and number of Chinook salmon emigrants. As part of screw trap sampling, staff will continue to tag naturally produced fall-run Chinook salmon with a coded wire tag to compare their return success with that of hatchery releases. As fish return over the next several years, we will analyze these data. DWR tagged approximately 65,000 juvenile salmon in 1998, 135,000 in 1999, and 150,000 in 2000.

DWR has also investigated the production of juvenile salmon and steelhead from a small side channel called Hatchery Ditch. In the 1999-2000 emigration period, DWR trapped approximately 94,000 juvenile fall Chinook in Hatchery Ditch.

Egg Survival Studies and Spawning Aerial Surveys. Aerial photographs of spawning sites and in-channel egg survival studies provide information on the amount of habitat used for spawning and the relative egg survival at different river reaches. Egg survival studies conducted by DWR in 1998 and 1999 revealed that survival is reduced as salmon move upstream. The main cause for the reduction in survival may be egg superimposition caused by the large number of adults crowding into the Low Flow Channel. The number of spawning Chinook salmon in most years greatly exceeds the available habitat. For example, 1999-00 emigration data from Hatchery Ditch (a small side channel in LFC) reveal that the actual survival from egg deposition to emergence from the gravel may only be between 5 and 15 percent. Egg superimposition is clearly reducing survival due to the high number of adult spawners in such a small area, since approximately 2,000 female and 1,300 male fall-run Chinook died in Hatchery Ditch in 1999, while only 1,000 females actually spawned.

Spawning Escapement Surveys. Past Chinook salmon adult escapement (carcass) surveys have been conducted by DFG. Estimates of the spawning run range from a low of 10,000 in 1979 to a high of 86,000 in 1955. The 1969-89 period is somewhat stable compared to pre-Oroville Dam estimates. These estimates ranged from roughly 10,000 salmon in 1953 to 86,000 in 1955. The stability after Oroville Dam is likely due to hatchery influence. Before 1967, all Chinook salmon in the Feather River spawned in the river. Estimates for the number of wild Chinook spawning in the Feather River since project construction are not available. Escapement estimates of adult Chinook salmon since project completion have included both wild and hatchery salmon that spawned in the river. As coded wire tag data are recovered over the next several years, more information will be available on the number of wild Chinook salmon spawning in the Feather River. DWR and DFG are working to refine adult Chinook salmon escapement estimates.

Redd Dewatering and Juvenile Stranding Surveys. Because the Oroville Dam-Thermalito Complex often varies flows for water operations and Delta requirements, concern exists about the impact of varying water flows on redd dewatering and juvenile stranding. Each October 15, the flows in the lower reach of the Feather River (below Thermalito Afterbay) are reduced, dewatering some redds. Recent studies conducted by DWR demonstrate two very important points: (1) the great majority of fall-run Chinook salmon spawn in the low flow section of the river and are therefore not subjected to redd dewatering; and (2) some redd dewatering does occur in the lower reach but is minimal compared to total run size (approximately 0.3-1 percent of the redds are dewatered, depending on the number of spawners in any given year and the timing of spawning).

Additionally, juvenile stranding (in off-channel ponds) can occur during high flow events and even during normal operations. Some stranding, typically associated with higher flow events (>25,000 cfs), has occurred within normal river operations. DWR has substantially increased its effort to evaluate both juvenile stranding, and redd dewatering. DWR will also revisit the ramping criteria - how fast the flows are reduced at the Thermalito Afterbay Outlet - to determine the benefit of adjusting criteria to allow juveniles to move out of potential stranding areas as flows are dropped.

Steelhead Self-Creel Surveys. DWR is currently working with several local anglers to gather more detailed information on the life history of Feather River adult steelhead. Data collection includes the size of fish caught, whether the fish are wild or of hatchery origin, general coloration, and whether the fish are kept or released. More data is needed to assess whether there are two runs of steelhead in the Feather River.

Invertebrate Research: To learn more about what may be limiting to juvenile steelhead in the lower Feather River, DWR, in cooperation with CSU, Chico, is conducting an invertebrate study. This study has three main goals: (1) to determine differences in the invertebrate populations above and below the Thermalito Afterbay Outlet; (2) to determine differences in invertebrate populations between the main channels and nearby side (secondary) channels; and (3) to determine diet preferences by examining stomach contents of juvenile salmon and steelhead.